

## WHAT IS CLAIMED IS:

1. A crystal scintillator comprising a transparent single crystal of cerium-activated lutetium yttrium oxyorthosilicate having the general formula  $\text{Lu}_{(2-x-z)}\text{Y}_x\text{Ce}_z\text{SiO}_5$ , wherein  $0.05 \leq x \leq 1.95$  and  $0.001 \leq z \leq 0.02$ .
- 5 2. The crystal scintillator of claim 1, wherein  $0.2 \leq x \leq 1.8$ .
3. The crystal scintillator of claim 2, wherein said scintillator has a luminescence wavelength of about 420 nm.
4. The crystal scintillator of claim 3, wherein said scintillator has a luminescence decay time of about 35-45 ns.
- 10 5. A scintillation detector, comprising:
  - (a) the crystal scintillator of claim 1, and
  - (b) photodetector optically coupled to said crystal scintillator for detecting light from said crystal scintillator.
- 15 6. The detector of claim 5, wherein said photodetector comprises a photomultiplier tube.
7. The detector of claim 5, wherein said photodetector comprises a charge-coupled device.
- 20 8. A scintillation detector, comprising:
  - (a) the crystal scintillator of claim 2, and
  - (b) a photodetector optically coupled to said crystal scintillator for detecting light from said crystal scintillator.
9. The detector of claim 8, wherein said photodetector comprises a photomultiplier tube.
10. The detector of claim 8, wherein said photodetector comprises a charge-coupled device.